**“Teaching Responsible Research and Innovation in Higher Education: a Train the Trainers course”**

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| **Audience** | **Academic and non-academic HEI staff who aim to teach RRI in HEI** |
| **Year of study** | **-** |
| **Number of ECTS credits** | **No ECTS credits awarded. Workload of approximately 15 to 20 hours.** |

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Please remember that the resources at hand **can (and should) be adapted** to your specific needs and context. The HEIRRI resources have been **designed to be flexible**, so we encourage you to think about including **local cases**, adjusting the **timings** of the course to your needs, and also adapting some contents to your specific **field or discipline**.

**SYLLABUS**

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| --- | --- |
| **Element** | **Description** |
| **Title** | Teaching Responsible Research and Innovation in Higher Education |
| **Cycle** | In-service training; not part of a study programme. |
| **Year of study** | – |
| **Number of ECTS credits** | No ECTS credits awarded. Workload of approximately 15 to 20 hours. |
| **Learning outcomes (LO)** | On completion of this course participants will be able to:  1. formulate their understanding of responsible research and responsible innovation;  2. discuss approaches to promote RRI with regards to their applicability in research and innovation (R&I) processes;  3. adapt strategies and approaches for teaching and learning on RRI and propose concrete teaching activities for promoting RRI in higher education. |
| **Mode of delivery** | This course is an online training featuring different materials (e.g. articles, texts, videos, links) and interactive elements (online forum and chat). |
| **Prerequisites and co-requisites** | Participants should have a basic knowledge of philosophy of science, science technology studies, sociology of science, or similar. Furthermore, they should have experience in research or innovation processes as well as in higher education teaching. |
| **Course content** | In this online course, participants will reflect on what responsible research and responsible innovation mean, and learn and discuss ideas and concepts of RRI as well as some practical approaches to promote RRI. One focus in this regard will be on teaching and learning RRI in higher education. |
| **Recommended or required reading and other learning resources/tools** | * Kuhlmann, S., Edler, J., Ordónez-Matamoros, G., Randles, S., Walhout, B., Gough, C., & Lindner, R. (2016). *Responsibility Navigator*. Karlsruhe: Fraunhofer ISI. Retrieved 9 February 2017, from http://responsibility-navigator.eu/ * Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy, 10*(17). DOI:10.1186/s40504-014-0017-4 * RRI Tools (web): RRI Toolkit. https://www.rri-tools.eu/search-engine * Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy, 42*(9), 1568–1580. DOI:10.1016/j.respol.2013.05.008 * Tassone, V., & Eppink, H. (2016). *The EnRRICH tool for educators: Re-Designing curricula in higher education from a “Responsible Research and Innovation” perspective. EnRRICH Deliverable 2.3.* Retrieved 9 February 2017, from http://www.livingknowledge.org/fileadmin/Dateien-Living-Knowledge/Dokumente\_Dateien/EnRRICH/D2.3\_The\_EnRRICH\_Tool\_for\_Educators.pdf |
| **Planned learning activities and teaching methods** | The course requires a high level of motivation and autonomous work by the participants. They should read and comprehend the given texts, linked documents, and articles as well as case examples in defined time periods. The course participants must actively engage in several online forum and online chat activities at specific points during the online course. They should write entries answering to defined questions, comment on entries by others, and engage in discussions on RRI and related issues. |
| |  | | --- | | **Assessment methods and criteria** | |  |

**PROGRAMME STRUCTURE**

**“Teaching Responsible Research and Innovation in Higher Education”**

|  |  |
| --- | --- |
| **Part 1. Concepts and relevance of RRI** | **Activity** |
|  | Forum Activity 1: “The meaning of RRI” |
| Online Chat 1: “The meaning of RRI” |
| **Part 2. Practical approaches to RRI** | **Activity** |
|  | Forum Activity 2: “Practising RRI” |
| Online Chat 2: “Practising RRI” |
| **Part 3. Teaching RRI in higher education** | **Activity** |
|  | Forum Activity 3: “RRI teaching experiences and approaches” |
| Online Chat 3: “Barriers for teaching RRI” |

The three parts of this course should be completed sequentially. There should be a well-defined timeframe for each part and participants should be informed of the duration and deadlines of each part.

The description of the course structure and its implementation provided in this guide are not meant to be transferred one-to-one to an e-learning platform. Instead, it is strongly recommended to adapt the provided material to better align it to the audience, institutional conditions, and disciplines. In addition, teachers will have to draft some texts and elements in-between different parts or task descriptions themselves. In this guide, several sample texts to be modified and used in the courses are provided. These sample texts are called **online course elements**, and can be found in their corresponding sections

In this online course, participants should work independently through the materials, watch videos, and read texts on RRI and related issues. They must actively produce texts to prove their reflections in an online forum and a real-time online chat. The teacher will set up and maintain the course on an e-learning platform and should monitor the forum activities, provide feedback, and support the participants if requested.

**ONLINE FORUM AND CHAT**

**Goal:**

*The goal of this course is for the students to independently work through the materials, watch videos and read texts on RRI and related issues.*

**Materials:**

* E-learning platform

**Description of the activity**

Central parts of this course are an online forum and a real-time chat. Both provide space for reflection on RRI and related issues.

The **online forum** provides the opportunity for participants to ask for clarifications and engage in discussions on specific aspects of RRI at any time. Furthermore, the forum format encourages the posting of comprehensive statements on various aspects of RRI and related issues. It produces a virtual space in which participants can engage with each other, present their ideas, comment on those of others, and participate in discussions. In each part of the course, there will be one forum activity and participants will have to write an entry. Apart from that, the forum will not be directed by a moderator, but threads can be created by the users themselves.

The **online chat** gives the possibility of immediate reaction and should encourage participants to engage in even more interactive and lively debates on selected issues. The fixed date of the online chat should support a temporal commitment; although participants should have some flexibility in studying the material, it seems important to set a frame in order to keep participants engaged. Every online chat should start with a short round of introduction in which each participant identifies themselves to create some sort of group feeling.[[1]](#footnote-1)

**Teacher’s role: How can the teacher direct the activity?**

In the online forum and chat, the teacher functions as a facilitator asking questions to initialise debates on RRI and related issues. The teacher should not intervene a lot in the discussions, but should help to maintain a constructive atmosphere and moderate if necessary. If the discussion does not get started or stops early, the teacher should post add-on and/or more questions, e.g. asking participants to clarify and further elaborate on certain aspects of their posts. For tips on how to use and manage an online forum for online courses, please see Pappas (2015) or Salmon (2003).[[2]](#footnote-2)

If it is not possible or feasible to implement an online chat for real-time discussions, it is suggested to consider **Adaptation Possibility 1** and replace the online chat with further forum discussions.

***Adaptation Possibility 1: Replacement of real-time online chat***

*The online chat provides a possibility to engage in real-time discussion with other participants and thus creates a better group atmosphere. However, in some cases it might not be possible to implement this activity due to, for example, lack of resources or if some participants of this online course may not be able to enter the chat on a regular basis for time reasons.*

*If the online chat activities are not a suitable option, they can be partially or entirely omitted and replaced by forum activities which tackle similar questions.*

**INTRODUCTION TO THE COURSE**

**Goal:**

*The aim of this activity is to outline the structure and content of the course, its different elements and how to use them.*

**Learning outcomes:**

During this activity:

* Participants will get to know each other
* A better sense of a community of learners can be established

**Materials:**

* E-learning platform

**Description of the activity**

The first task participants should carry out is to introduce themselves by giving a brief overview detailing their professional field, working position, interests, etc.

**Teacher’s role: How can the teacher direct the activity?**

This task can be made an obligatory part in the enrolment process. It might be advised to use features like user-selected or generated avatars or profiles (including user photos) that can be displayed on a central page.

**Online course elements:**

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| **Online course element 1. Suggestion for course introduction text**  **Introduction to the course**  Welcome to the online course on *Teaching Responsible Research and Innovation in Higher Education*!  Research and innovation (R&I) are important cornerstones of past and contemporary societies. Through R&I, societal, economic, cultural, ecological, technical, and other challenges have been addressed, transformed, solved, or produced. R&I developments initiated and promoted the reflection and thinking about many different aspects of our world, environments, societies, and biological and human existence. R&I brought radical change upon our coexistence and lives and can be seen as major transformative forces of, and in, society. At the same time, as much as R&I are driving forces of societal transformation, society is forming and defining R&I through societal structures, practices, institutions, values, and norms.  R&I objectives and processes, as well as many of the changes caused and promoted by them, can be seen both positively and negatively, depending on the perspective you choose, the aspects you consider in your assessment, or the information and knowledge you have. A decision on their positive and negative evaluation is often not possible beyond doubt or has so many facets that an unambiguous answer is not possible.  In this complex situation, it is nevertheless necessary to decide on whether or not we should start and how we should implement certain R&I developments and processes. People involved in R&I, politicians, interest groups, different other societal stakeholders, and the broader public start to think about and deliberate on how to care about certain R&I developments and related issues or about the way we organise and do R&I in general. In this context, questions such as the following come up: Is this responsible? Is it responsible to deal with these issues in one way or another? Is this responsible in view of the next generation, our environment, our safety, our society, our freedoms, etc.? In short: How should R&I be dealt with in a responsible manner? How should R&I be done in a responsible manner?  In this online course you will learn about, reflect on and discuss what responsible research and responsible innovation could mean in general, and what recently emerging concepts of Responsible Research and Innovation (RRI) are all about (Part 1). Then you will deal with approaches which have the potential to make R&I processes more “responsible” (Part 2). In the last part (Part 3), you will learn different ways to introduce concepts of RRI and related issues in higher education teaching.  Throughout the course you will find short information texts and videos, primary literature, and further material (and references) to read and work with. In every part of the course, you will should write an entry in the online forum on a specified topic and then read and discuss your and other entries with the other course participants. Please take your time in thinking about the questions raised and in writing your entry. Do not forget to read and comment on the entries of the other participants. In doing this, please acknowledge the efforts your colleagues put into drafting their texts and be constructive and respectful in replying to their entries. You should come back to the forum several times and have a look if new entries have been posted. Please also abide to the submission deadline.  If you have any questions, please post them in the dedicated section of the online forum or contact the teacher. Feel free to raise issues related to RRI or other relevant aspects of the course by creating own threads in the online forum. |

**PART 1. CONCEPTS AND RELEVANCE OF RESPONSIBLE RESEARCH AND INNOVATION (RRI)**

Part 1 of the course starts with a short introductory text presenting its issues and topics (**see Online Course Element 2**). Please adapt, extend, and enhance the text to your own needs and bring in aspects of responsibility you deem crucial in your own field. This introduction should open up reflections on responsibility and not close it down by presenting a certain definition of responsibility or RRI.

**Forum Activity 1: “The meaning of RRI”**

**Goal:**

*The aim of this activity is for the participants to reflect on what it means to them to be “responsible” in the processes of research and innovation.*

**Learning outcomes:**

After this activity, the students should be able to:

* Comprehend the general meaning of responsibility in research and innovation.

**Materials:**

* E-learning platform
* HEIRRI transdisciplinary scenarios (ageing and food)

**Description of the activity**

The introduction is followed by a short reflection exercise. Participants should think about their own understanding of responsibility in the context of research and innovation (R&I) by writing a forum entry. This bottom-up approach emphasises the societal constructiveness and relativity of what is seen as “responsible” and should initiate a first reflection of the participants on their own often implicit understanding of what is “responsible” with regards to research and innovation processes and outputs. The questions are open by purpose: The participants should not be directed in one way or another, only focusing on specific aspects of responsibility (e.g. personal responsibility, systemic responsibility, etc.) or certain stages in R&I (e.g. organising R&I activities, the R&I processes, or the output and outcomes of these processes).

**Teacher’s role: How can the teacher direct the activity?**

The course teacher should select a submission date that gives participants enough time to think about and post their ideas, but also to then read and react to the entries of others. To set a deadline for submitting and commenting is crucial in order to generate a higher degree of commitment. If possible in the given e-learning framework, participants should have to submit their entry before they are allowed to proceed to the subsequent input on RRI.

**Online course elements:**

**Online course element 2. Suggestion for Part 1 introduction text**

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| **Introduction to Part 1: “Meaning and relevance of RRI”**  In the first part of our course, we will deal with the question what “responsible” research and “responsible” innovation might mean.  This is not an easy task. The terms “responsible”, “research”, and “innovation” have manifold meanings and evoke different pictures depending on the context in which we use it, our own culture, upbringing and socialisation, field of study and profession, political view, and so forth. When thinking and talking of “responsibility” many questions come to mind:   * *Who can be responsible in principal?* * *Who is responsible in a certain situation?* * *What are these people responsible for?* * *What type of responsibility are we talking about?* * *When and how can and when and how should we exercise our responsibility?* * *Why do we have a certain responsibility?*   Here and now we do not want to start a deep and complex philosophical discussion invoking the ideas of dead or living philosophers, ethicists, legal scholars, sociologists, theologians, or others. Before turning to the concept this course revolves around, that of “Responsible Research and Innovation” (RRI), we are simply going to ask ourselves what comes to our minds when talking of “responsibility” in contexts of R&I and with regard to concrete R&I activities. In order to think about responsibility in concrete examples, you can watch one of the HEIRRI scenarios about research and innovation approaches in the topics of ageing and food, identify possible future benefits and risks and reflect about the meaning of responsibility in R&I, considering the previous questions. |

**Online course element 3. Suggestion for Forum Activity 1: What does RRI mean to you?**

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| **Forum Activity 1: “The meaning of RRI”**  Please think about research and innovation processes and developments in your field and beyond. Then reflect and try to answer the following questions:  *What is responsible research, what is responsible innovation in your opinion?*  *What is irresponsible research or irresponsible innovation?*  Keep in mind that there is no definitive or “right” answer to these questions and that you are free to voice your personal views. Please illustrate your answers with concrete examples to make it easier for the others to understand your points.  Post your answer in the online forum, read the entries of other participants, and do not forget to comment on them in a constructive and respectful manner. You should submit your entry before [insert date]. Then you will have time until [insert date] to read and react to the entries of the other participants. Do not forget to visit the forum from time to time to see the entries of your colleagues. |

**Activity 2. “Overview of RRI”**

**Goal:**

*The aim of this activity is to provide the students with a general view of RRI.*

**Learning outcomes:**

After this activity, the students should be able to:

* Formulate their understanding of responsible research and responsible innovation.
* Identify the main aspects of RRI.

**Materials:**

* E-learning platform
* Online chat
* Multimedia materials:
  + “Responsible Research and Innovation: aligning R&I with European society”, produced by the European Union: <https://www.youtube.com/watch?v=bs5A-4j5h-I>
  + “The Potentials and Barriers of Responsible Research and Innovation (RRI)”, produced by the Res-AGorA project: <https://www.youtube.com/watch?v=nCOsF2U2lsU>
  + “What is responsibility in Research and Innovation?”, produced by RRI Tools: <https://youtu.be/Qr2KZW4jbow>
* Readings:
  + Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy, 10*(17). DOI:10.1186/s40504-014-0017-4

**Description of the activity**

After the first forum activity, participants get an overview of Responsible Research and Innovation (RRI). In a video followed by a short text, the basic ideas behind RRI are outlined.

Possible videos are:

* “Responsible Research and Innovation: aligning R&I with European society”, produced by the European Union
* “The Potentials and Barriers of Responsible Research and Innovation (RRI)”, produced by the Res-AGorA project
* “What is responsibility in Research and Innovation?”, produced by RRI Tools

In this material, both broader concepts reflecting the overall science–society relationship and concepts defining a specific number of dimensions and approaches towards RRI are presented.

The students are set a reading assignment to carry out once they have grasped the basic notions of RRI: the article by Rip, A. (2014).

At the end of Part 1, when all participants have completed the different elements and the reading assignment, the first online chat will take place. In this, participants are encouraged to reflect their own understanding of responsibility considering the concept(s) of RRI, think about their initial post in the online forum, and reflect on the posts of the other participants.

**Online course elements:**

An example text for an overview of RRI could be:

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| --- |
| **Overview of RRI** |
| Research and innovation (R&I) are important cornerstones of past and contemporary societies. Through R&I, societal, economic, cultural, ecological, technical, and other challenges have been addressed, transformed, solved, or produced. R&I developments initiated and promoted the reflection and thinking about many different aspects of our world, environments, societies, and biological and human existence. R&I brought radical change in our coexistence and lives and can be seen as major transformative force of and in society. At the same time, as much as R&I are driving forces of societal transformation, society is forming and defining R&I through societal structures, practices, institutions, values, and norms.  R&I objectives and processes as well as many of the changes caused and promoted by them can be seen both positively and negatively, depending on the perspective you choose, the aspects you consider in your assessment, or the information and knowledge you have. A decision on their positive and negative evaluation is often not possible beyond doubt or has so many facets that an unambiguous answer cannot be provided.  In this complex situation, it is necessary to together decide on the direction of R&I processes and developments. People involved in R&I, politicians, interest groups, different other societal stakeholders, and the broader public should start to think about and deliberate on how to care about certain R&I developments and related issues or about the way we organise and do R&I in general. In this context, questions such as the following come up: Is this responsible? Is it responsible to deal with these issues in one way or another? Is this responsible in view of the next generation, our environment, our safety, our society, our freedom? In short: How should be dealt with R&I in a responsible manner? How should R&I be done in a responsible manner? |

**Online course element 4. Suggestion for Online Chat 1**

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| **Online Chat 1: “The meaning of RRI”**  After more general clarification of upcoming questions, two key questions should be raise in the online chat:  *What do you think of the concepts of RRI?*  *How does RRI relate to your own definition of responsible research and innovation?* |

**PART 2. PRACTICAL APPROACHES TO RRI**

**Goal:**

*The goal of this Activity is for participants to get to know selected strategies and practical approaches to steer R&I processes towards RRI.*

**Learning outcomes:**

After this activity, the students should be able to:

* Analyse different practical approaches to promote reflection on RRI
* Discuss approaches to promote RRI with regards to their applicability in research and innovation processes.
* Asses the possibilities and barriers of each approach
* Propose new ways of promoting reflection on RRI
* Incorporate the new perspectives and knowledge acquired related to RRI into their work and/or studies

**Materials:**

* E-learning platform
* Online chat
* Readings:
  + Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy, 42*(9), 1568–1580. DOI:10.1016/j.respol.2013.05.008
  + Kuhlmann, S., Edler, J., Ordónez-Matamoros, G., Randles, S., Walhout, B., Gough, C., & Lindner, R. (2016). *Responsibility Navigator*. Karlsruhe: Fraunhofer ISI. Retrieved 9 February 2017, from http://responsibility-navigator.eu/
  + RRI Tools website (<http://www.rri-tools.eu)>
* Exemplary cases. **See HEIRRI CASES GUIDE.**

**Description of the activity**

Participants will read two texts on holistic RRI approaches and case examples. We suggest the two texts mentioned in this section’s bibliography; however, please feel free to choose other papers from our recommended RRI literature list you will find on the HEIRRI website.

* Responsibility Navigator (Kuhlmann et al., 2016): This “thinking tool” gives actors in R&I orientation for making R&I more responsible. It identifies ten principles and gives related questions to deliberate on in organising and conducting R&I processes.
* Framework for responsible innovation (Stilgoe et al., 2016): In this paper, a general governance framework for RRI is developed and then a case of “responsible innovation in action” is given.
* RRI Tools website (<http://www.rri-tools.eu)>: offers a growing number of practices and approaches of, projects on, or other entries on RRI, and give them some guidance on the “tools” this comprehensive database offers. They should browse through the RRI Toolkit database (https://www.rri-tools.eu/search-engine) and identify one tool, inspiring practice, or project they consider interesting and useful.

A selection of exemplary cases of RRI is provided to the participants to help in the reflection process. These cases are classified according to the main key aspects of RRI that are represented and by the field of study. The key aspects are:

* Ethics
* Sustainability
* Inclusive Science
* Gender Equality

The students can read these cases and explore in more depth the projects with the provided bibliography to help them formulate a global vision of what RRI means. The cases include a selection of reflection questions which the participants can answer if desired. There are some case examples with the questions already answered, to provide guidance for the students.

Participants should also be stimulated to think about how their own higher education institution is supporting RRI and how they themselves, in their department or research group, could make a difference in this regard.

Furthermore, they should reflect on how to make meaningful use of concepts and approaches towards RRI. Participants will write a short entry in the forum and then engage in real-time discussions in the final online chat.

The provided cases are the following:

Architecture/Urbanism

**Gender Equality**

* HOUSING AND NEIGHBOURHOOD DESIGNS

Public Health

Biomedical Research

**Gender Equality**

* HIV MICROBICIDES

Biomedical Research

Public Health

**Gender Equality**

* MALVECBLOK

Public Health

**Sustainability**

**Inclusive Science**

**Gender Equality**

* *CASAS MATERNAS*

Sociology

**Sustainability**

Ecology

**Inclusive Science**

* IMRR

Environmental Sciences

**Inclusive Science**

**Sustainability**

* KLIMA ALLTAG

Marine Biology Research

**Inclusive Science**

**Sustainability**

* PIER

Public Health

Environmental Sciences

**Sustainability**

**Inclusive Science**

* MOSQUITO ALERT

Waste Management

**Inclusive Science**

**Sustainability**

* MARLISCO

Biomedical Research

**Ethics**

* TRREE PROJECT: ADOLESCENTS IN HIV RESEARCH

Biomedical Research

**Inclusive Science**

**Ethics**

* PPI PARKINSON’S

**Sustainability**

Botany

Sociology

**Ethics**

**Inclusive Science**

* THE BUCHU PLANT

Education

**Inclusive Science**

**Ethics**

* UCL CHANGEMAKERS

Technology

**Inclusive Science**

* AMBIACT

Biomedical Research

Science Education

**Inclusive Science**

* DNA LABS

**Sustainability**

Environmental Sciences

**Inclusive Science**

* SUSTAINABILITY IN PRISONS

Sociology

Education

History

**Inclusive Science**

Sociology

* CROSSCULT

**Online course elements:**

**Online course element 5. Suggestion for Part 2 introductory text**

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| **Introduction to Part 2: “Practising RRI”**  In the first part of our course we dealt with the meaning of responsibility with regards to R&I in general and concepts of RRI in particular. We saw that there are various understandings of what “responsible” R&I processes and outputs could be and how “responsibility” is conceptualised in different takes on RRI.  In this part of our online course, we want to turn to the more applied side of RRI and think about how R&I processes could be made more responsible in practice. In this context it is important to notice that the goal of making R&I “more responsible” does not mean that past and ongoing R&I endeavours have not been responsible in general, or that researchers, engineers, and other involved actors behaved irresponsibly. However, as you might have observed when reading other course participants’ elaborations on “irresponsible” research, there have always been processes going on and producing (unintended) outcomes which can be assessed negatively. Furthermore, even very positive developments might have benefitted through the consideration of aspects of RRI in their planning and implementation and might also have become more satisfying for all involved actors.  As you will see, the same holds true for definitions of RRI as for practical approaches to promote RRI: they are numerous. Thus, you will deal with some exemplary approaches to promote RRI, you will learn about specific places where you can find additional ones, and learn about RRI practices in more depth. However, you will not only get to know practices of RRI, but will also have to reflect upon and deliberate on how to put RRI in place in your own institutional context. |

**Online course element 6. Suggestion for Forum Activity 2: “Practising RRI”**

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| **Forum Activity 2: “Practising RRI”**  Considering what you have learned about concepts of RRI and approaches to promote RRI, please think about your own experiences in research and innovation and the higher education institution you are working in:  *How would you assess the principles described in the “Responsibility Navigator” and in the framework by Stilgoe, Owen, and Macnaghten?*  *How are they applicable in your working context?*  Please feel free to not only openly voice your personal opinion, but also argue why you are thinking one way or another. If possible, illustrate your answers with concrete examples to make it easier for the others to understand your points.  Post your answer in the online forum, read the entries of other participants, and do not forget to comment on them in a constructive and respectful manner. You should submit your entry before [insert date]. Then you will have time until [insert date] to read and react to the entries of the other participants. Do not forget to visit the forum from time to time to see the entries of your colleagues. |

**Online course element 7. Suggestion for Online Chat 2: “Practising RRI”**

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| **Online Chat 2: “Practising RRI”**  After more general clarification of upcoming questions, two key questions should be raised in the online chat:  *How have you already worked towards making research and innovation more responsible?*  *Which opportunities and which challenges have you experienced in this regard?* |

**PART 3. TEACHING RRI IN HIGHER EDUCATION**

**Goal:**

*The aim of this activity is for participants to outline how to promote reflection and related issues in higher education settings.*

**Learning outcomes:**

After this activity, the students should be able to:

* Analyse different education methodologies to promote reflection on RRI
* Asses the possibilities and barriers of each education methodology
* Adapt strategies and approaches for teaching and learning on RRI
* Propose concrete teaching activities for promoting RRI in higher education

**Materials:**

* E-learning platform
* Online chat
* HEIRRI training programmes. (Available on the HEIRRI website and in the HEIRRI section of the RRI tools website)

**Description of the activity**

After the participants have learnt about the basics of RRI and practical RRI approaches, they get to know how to teach RRI themselves.

Adequate learning outcomes, course contents, course designs, and teaching methods for different educational levels are presented and then some example courses will be given. This part draws on the rich findings from the HEIRRI project and presents selected RRI training programmes as well as hints for their implementation. Furthermore, selected recommendations are given for further enquiry on appropriate teaching of RRI and related aspects.

In the final forum activity, participants should then think about how they could integrate RRI teaching and learning into existing courses or curricula. Together, they should then start to deliberate on how to transfer the knowledge from this course into their higher education institutions. They should come up with concrete ideas about how to integrate an RRI course into the study programmes they are affiliated to.

The last online chat encourages participants to discuss their experiences with teaching RRI-related topics and link it with their ideas of integrating RRI teaching into higher education. They should think about and discuss possible barriers for such integration and try to come up with strategies to circumvent these barriers. After exchanging opinions and experiences and after having a discussion on these questions on the barriers for teaching RRI, the online chat should end with a more general round of feedback concerning the online course, its content, and structure.

**Teacher’s role: How can the teacher direct the activity?**

Part 3 of this train-the-trainer course presents guidance on how to teach RRI in higher education contexts.

In this part, examples for teaching RRI outlined in HEIRRI training programmes (available on the HEIRRI website and in the HEIRRI section of the RRI Tools website) should be included. It is up to the teacher to decide the examples. However, we suggest presenting a broad range of programmes in terms of the target audience, e.g. one programme for bachelor’s students, another for master’s students, and yet another for PhD candidates. In the HEIRRI training materials you will also find further specific materials on teaching approaches which are appropriate for organising and facilitating learning on RRI. Please select a range of materials and present it to your course participants. It is also possible to split your online class and assign certain materials to specific individuals.

After the third online chat, the course ends. If participants want to further learn about RRI and teaching RRI, a list of recommended literature as well as a list of links to appropriate websites about RRI should be provided; you will find a commented list of recommended literature to use for this purpose on the HEIRRI website and in the HEIRRI section of the RRI Tools website. Since this course is an in-service training, no assessment of participants’ achievement is envisaged. However, by implementing **Adaptation Possibility 2**, participants’ achievements can be assessed and they can receive ECTS credits for completing the course.

***Adaptation Possibility 2: Assessment and grading of participants***

*In some contexts, it might be necessary to assess the achievements of the participants, grade them, and award ECTS credits on completion of the course. For example, PhD students in a structured doctoral programme might also want to take courses to improve their teaching abilities, but will need credits to meet their study programme’s requirements.*

*In order to receive credits for completing this course, we suggest collecting and grading the contributions of the enrolled course participants. In the online course, there are several forum activities and all participants will submit entries in which they reflect or elaborate on different issues of RRI. The online chat is another possibility for the participants to contribute to the course.*

*This very open approach to assess learning outcomes regarding RRI is in line with HEIRRI’s basic understanding of RRI as a broad approach that needs to be openly reflected upon and which is hard (and probably futile) to press into a tick-box exercise (e.g. as a quiz or multiple-choice test).*

*The syllabus for the course must be changed and it should be made explicit that the continuous and active participation in the online forum and chat are necessary to complete the course and receive a final grade.*

**Online course elements:**

**Online course element 8. Suggestion for Part 3 introductory text**

|  |
| --- |
| **Introduction to Part 3: “Teaching RRI in higher education”**  In the first part of this course, you reflected on and learned about what responsible research and responsible innovation can mean and how concepts of RRI and practical approaches try to deal with these issues. What’s more, you also had to think about your own understandings, your own experiences, and possibilities to transfer your newly acquired knowledge into your own working context. Now we will turn to one important means to spread ideas of RRI and promote the practical implementation of RRI in research and innovation in the long run.  Most researchers, engineers, and other people working in or with regards to R&I, including policy makers, members of funding agencies or civil society organisations, science teachers, etc. learn about how R&I processes are organised and implemented as a student in school or higher education institutions for the first time. Only later do they get first-hand insights in a work context. Today’s students will be future researchers, developers, policy makers and other actors practising and influencing R&I. Thus, it is crucial to enable them to think about their own work in R&I and that of others, and to apply a broader perspective by taking into account societal needs and values, the perspective of stakeholders and affected groups, the long-term and unintended effects of their work, etc. They should learn to consider, reflect, and put into practice principles of RRI, but also critically reflect on RRI concepts and impacts.  In this last part of our course, you will get to know a variety of approaches for teaching and learning RRI in higher education. You will see that teaching and learning RRI does not mean to only present concepts of RRI and methods to implement RRI to students. Rather, it means to initiate a process of thinking and reflecting about the notion of “responsibility”, about the relationship between science and society, and about ways how fruitful and constructive cooperation between different actors and groups in and beyond R&I can be promoted. |

**Online course element 9. Suggestion for Forum Activity 3: “Teaching experiences and approaches”**

|  |
| --- |
| **Forum Activity 3: “RRI teaching experiences and approaches”**  Now, after you have read about how RRI could be integrated into higher education teaching, please think about your own experiences and answer the following questions:  *What are your experiences with teaching RRI or topics related to RRI (ethics, research integrity, open access, etc.) in higher education?*  *How could you make use of the presented training programmes and teaching approaches? Please bring forward an idea of how to integrate learning on RRI into one of your own courses!*  Post your answer in the online forum, read the entries of other participants, and do not forget to comment on them in a constructive and respectful manner. You should submit your entry before [insert date]. Then you will have time until [insert date] to read and react to the entries of the other participants. Do not forget to visit the forum from time to time to see the entries of your colleagues. |

**Online course element 10. Suggestion for Online Chat 3: “Barriers for teaching RRI”**

|  |
| --- |
| **Online Chat 3: “Barriers for teaching RRI”**  Now that you have dealt with teaching RRI in higher education and read about concrete possibilities to approach this issue, please think about the following:  *What could be possible barriers for integrating RRI teaching into higher education?*  *How could one deal with these barriers?* |

**Bibliography**

* Tassone, V., & Eppink, H. (2016). *The EnRRICH tool for educators: (Re-)Designing curricula in higher education from a “Responsible Research and Innovation” perspective. EnRRICH Deliverable 2.3.* Retrieved 9 February 2017, from http://www.livingknowledge.org/fileadmin/Dateien-Living-Knowledge/Dokumente\_Dateien/EnRRICH/D2.3\_The\_EnRRICH\_Tool\_for\_Educators.pdf

**SURVEYS AFTER IMPLEMENTATION**

The HEIRRI project has developed surveys for post-project application of HEIRRI training programmes and materials. These surveys follow the design used for pilot evaluation, with a few additional open-ended questions, based on adaptations, difficulties encountered and opinions on the future of RRI in education.

Please respond to the relevant surveys after using the teaching resource at hand:

1. Survey for **students**: <https://www.surveymonkey.com/r/3PBQYZN>

2. Survey for **teachers**: <https://www.surveymonkey.com/r/3P37NG7>

For public engagement events:

3. Survey for the **public** (museum events): <https://www.surveymonkey.com/r/36L8Z6R>

4. Survey for **facilitators** (museum events): <https://www.surveymonkey.com/r/3P6WY2V>

Please remember that the resources at hand can (and should) be a**dapted to your specific needs and context**. The HEIRRI resources have been designed to be flexible, so we encourage you to think about including **local cases**, adjusting the **timings** of the course to your needs, and also adapting some contents to your specific **field or discipline**.

**ANNEXES**

* ANNEX 1. HEIRRI Cases
* ANNEX 2. HEIRRI Cases with answers

**ANNEX 1. HEIRRI CASES**

**TABLE OF CONTENT**

* INTRODUTION TO RRI CASES
* GENDER EQUALITY
  + HOUSING AND NEIGHBOURHOOD DESIGNS
  + HIV MICROBICIDES
  + MALVECBLOK
  + *CASAS MATERNAS*
* SUSTAINABILITY
  + IMRR
  + KLIMA ALLTAG
  + PIER
  + MOSQUITO ALERT
  + MARLISCO
* ETHICS
  + TRREE PROJECT: ADOLESCENTS IN HIV RESEARCH
  + PPI PARKINSON’S
  + THE BUCHU PLANT
  + UCL CHANGEMAKERS
* INCLUSIVE SCIENCE
  + AMBIACT
  + DNA LABS
  + IMRR
  + KLIMA ALLTAG
  + PIER
  + MOSQUITO ALERT
  + MARLISCO
  + PPI PARKINSON’S
  + SUSTAINABILITY IN PRISONS
  + CROSSCULT

**INTRODUCTION TO RRI CASES**

The cases proposed below are used in different Higher Education programmes. These case examples can be useful to promote a reflection on responsibility in R&I issues related to: Gender, Sustainability, Ethics and Inclusive Science. Some of these cases can be used for different aspects (see the previous list). The HEIRRI project has identified and defined these different aspects (Gender, Sustainability, Ethics, Inclusive Science) from the 6 key issues proposed by European Commission just for methodological and pedagogical purposes.

The cases consist of:

-A brief description of the case

-The bibliography of the case

-The learning objectives of the case

-The reflection questions of the case

**How can these cases be used in class?**

To start the activity, the teacher will give the students/participants the brief description of the case. If the teacher considers that the students need more information to generate a good debate/discussion, each case is provided with useful links and bibliography to add more information.

The instructor will have also the learning objectives, what the students/participants are expected to learn during the activity, and some reflection questions. After the students/participants have read the description of the case, the teacher can use the reflection questions that we propose here to generate a robust discussion. These reflection questions are specific for each case and for each issue (Gender, Sustainability, Ethics and Inclusive Science). Furthermore, with the reflecting questions posed by the teacher, the students can analyse the controversies of each aspect to construct a deeper discussion and consolidate knowledge on each one. The instructor can also add more reflection questions if needed or to enrich the debate.

After the discussion, the teacher can end the activity with the conclusions formulated by all the students’ contributions.

**GENDER EQUALITY**

**“Housing and Neighbourhood design: analysing gender”**

*RRI Key issues: gender*

The website Gendered Innovations presents a case study called “Housing and Neighbourhood design: analysing gender”[[3]](#footnote-3) with the aim of providing an example of how urban design may incorporate a gender perspective.

In the website, it is said that “gender roles and divisions of labour result in different needs with respect to built environments”, which sometimes reinforce gender roles or can’t provide equal services to women and men[[4]](#footnote-4). These differences can be visible at many levels, from single buildings to whole neighbourhoods, cities or even regions, and can also be seen within cities through its means of transport, public facilities, housing, open spaces, and so on. This case in Gendered Innovations states that “urban design typically lacked a gender perspective, and was ‘blind’ to differences between groups”. It should be taken into account that the entity UN Women[[5]](#footnote-5) states that, around the world, women carry out at least two and a half times more unpaid household and care work than men[[6]](#footnote-6).

In Vienna, Gendered Innovation writes, the gender analysis integrated in its urban planning has contributed to the city’s quality of life, and as an example of this planning, the project “Frauen-Werk-Stadt I” is described. This initiative designed a whole area of the city[[7]](#footnote-7) that didn’t separate housing from commercial spaces, nor from childcare facilities, medical centres or police stations. This way, according to Gendered Innovations, overall car use was reduced, as well as the stress experienced by those people combining career and house/family care, since “Frauen-Werk-Stadt I” was designed in a way where daily needs could be met within the vicinity of the apartments.

**Learning objectives**

* To identify the gender issues involved in this project
* To describe which gender policies should be implemented: equal opportunities for women and men in this research
* To discuss which gender issues should be taken into account in the research content
* To analyse how the gender issues have been addressed and which stakeholders have been involved in the process

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Does the case presented reflect on gender roles and tasks typically attributed to men/women?
* Do you think this case presents gender equality in a simplistic way? How could it be improved?
* Can you think of arguments against gender equality in urban planning? Could it reinforce gender stereotypes? Could it neglect other collectives?
* Do you think the urban planners did a public consultation, or rather they based their designs on stereotypes and preconceptions?
* Does this case include enough different perspectives? How could they be complemented or improved?

**“HIV MICROBICIDES: Rethinking Research Priorities and Outcomes”**

*RRI Key issues: gender*

As stated in the Gendered Innovations site of the case on “*HIV microbicides: Rethinking Research Priorities and Outcomes*”[[8]](#footnote-8), in the last years, both the European Union and the U.S. have invested to increase the number of women scientists and engineers[[9]](#footnote-9),[[10]](#footnote-10). However, from Gendered Innovations it is considered that women's participation is low in the STEM fields (i.e., science, technology, engineering, and mathematics), and they conclude that “increasing the number of women requires more than programmes focused on removing subtle gender bias from hiring and promotion practices, stopping tenure clocks, leadership training, and the like; such interventions are necessary but not sufficient”. They also state that, in order to increase the numbers of women in STEM fields, research should be re-conceptualised so that it includes “methods of sex and gender analysis in creative and forward-looking ways”. They say that since the image of engineers and the offering of engineering education “focus narrowly on mathematics and science”, many girls and young women “are dissuades from pursuing engineering careers“[[11]](#footnote-11), and argue that engineering would be more appealing to women “if engineering images and education fore-grounded the social aspects of engineering alongside the technical.[[12]](#footnote-12),[[13]](#footnote-13) "

To prove this point, Gendered Innovations mentions the case of a mechanical engineering lab at the University of California that shifted its research focus from applied physics to biomedical engineering and changed its research goals from “understanding the physics of a problem to developing models that could be used to evaluate devices or treatments for medical conditions”. Over the period of a decade, the lab researchers were a majority of women.

**Context** **information**

More than 36 million people worldwide live with HIV[[14]](#footnote-14). Gendered Innovations writes that most of the infections and related deaths happen in sub-Saharan Africa, where the prevalence of HIV infection among women aged 15-24 is about 8 times higher than that of men of the same age-group.[[15]](#footnote-15) The only woman-controlled HIV prevention option, the site states, is the female condom; however, it is detectable, requires partner consent, and is less available and more expensive than the male version.[[16]](#footnote-16)

According to Gendered Innovations, the lab from the University of California was able to develop a woman-controlled HIV protection because they understood in this context why HIV has a higher incidence in them. The result of the research is a vaginal gel that provides an HIV microbicide.

As a conclusion, the site writes that research priorities “have a profound effect on who will perform research”, as exemplified with the case of HIV microbicides at the mechanical engineering lab from the University of California: in that instance, “research priorities related to improving women's and men's health increased the representation of women in the lab”. The Gendered Innovations site concludes that “it is possible that changing research priorities in engineering could increase the representation of women in the field overall”.

**Learning objectives**

* To identify the gender issues involved in this project
* To describe which gender policies should be implemented: equal opportunities for women and men in this research
* To discuss which gender issues should be taken into account in the research content
* To analyse why the gender balance changed and what effect it had on the project

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Does this case reflect on gender roles and stereotypes?
* Does this case present gender equality in a biased way?
* Can you think of arguments against gender equality in research? Could there be problems related to imposed quotas or to positive discrimination (aka affirmative action)?
* What ethical problems could arise from the research presented?
* Are there other ways of increasing the number of women in engineering? Are these ways based on gender stereotypes?
* Does this case include enough different perspectives? How could they be complemented or improved?

**“MALVECBLOK Project”**

*RRI Key issues: gender*

As the World Health Organisation (WHO) reports, there were 212 million malaria cases worldwide in 2015, most of which occurred in the WHO African Region (90%)[[17]](#footnote-17),[[18]](#footnote-18). Malaria is caused by the parasite Plasmodium and is transmitted to humans by the mosquito *Anopheles gambiae* s.s. The strategies currently used to control mosquito populations are insecticides and mosquito nets, but the appearance of resistance and the lack of new insecticides hold up its control[[19]](#footnote-19).

The European project MALVECBLOK[[20]](#footnote-20), composed of three European countries and two African teams, wanted to get an integrated view of mosquito immunity and reproduction and to establish the mosquito interaction with the parasite in order to provide a new vision for malaria control.

The project aimed to consider, when studying the reproduction of the malaria mosquitos, the different gender roles in society (for example, that men and women interact differently with water, where the mosquito reproduces). These differences can be relevant because vulnerability to the disease and access to treatment tend to vary between men and women. According to the “Gender and Health” report (Module 2, Field 1) of the “Gender in EU funded research” website[[21]](#footnote-21), “a careful gendered analysis of how the outcomes can be used to actually improve disease control will be necessary. The success of any disease control programme depends on a gender-sensitive approach”.

**Learning objectives**

* To identify the gender issues involved in this project.
* To describe which gender policies should be implemented: equal opportunities for women and men in this research.
* To discuss which gender issues should be taken into account in the research content.

**Reflection questions**

* Do you think the case presented is a good example of responsible research? Why?
* Does this case reflect on gender stereotypes and roles?
* Can you think of arguments against including a gender perspective in research? Is it necessary for all sorts of research projects?
* Could including a gender perspective in research favour bias in its findings?
* How is gender portrayed in the research project presented? Which cultural and social issues are involved in it?

***Casas Maternas* in the Rural Highlands of Guatemala: A Mixed-Methods Case Study of the Introduction and Utilization of Birthing Facilities by an Indigenous Population**

*RRI Key issues: sustainability, inclusive science and gender*

In Guatemala, the NGO “Curamericas” established birthing facilities (or “*casas maternas*”) in an isolated region of the country with the aim to help reduce the high maternal mortality rate of indigenous women living there, who traditionally gave birth at home. This was achieved by providing “local access to community-based, culturally appropriate maternal services for routine deliveries”, according to the website of the [Communication Initiative Network](http://www.comminit.com/global/content/casas-maternas-rural-highlands-guatemala-mixed-methods-case-study-introduction-and-utili).

This website explains that the maternal mortality rate in Guatemala for indigenous women is twice as high as non-indigenous women. These days, after the construction of birthing facilities, “birth attendants are encouraged to bring patients for delivery at *Casas Maternas*, where trained staff are present and access to referral care is facilitated”. A study was conducted with 275 women surveyed and, together with *casas maternas*, volunteers visited homes to encourage the use of the facilities. The website says that various actors were identified as stakeholders, including the women delivering, midwifes and partners.

The [article](http://www.ghspjournal.org/content/ghsp/4/1/114.full.pdf) published in “Global Health: Science and Practice” states that Curamerica’s initiative strengthens maternity care and “has potential to increase health facility utilization in isolated mountainous areas inhabited by an indigenous population where access to government services is limited and where maternal mortality is high”.

According to the [World Health Organisation](http://www.who.int/mediacentre/factsheets/fs348/en/), “maternal mortality is higher in women living in rural areas and among poorer communities”. “Skilled care before, during and after childbirth can save the lives of women and new-born babies”.

**Bibliography:**

* <http://www.ghspjournal.org/content/4/1/114.full>
* <http://www.comminit.com/global/content/casas-maternas-rural-highlands-guatemala-mixed-methods-case-study-introduction-and-utili>
* <http://curamericasguatemala.blogspot.com.au/>
* <http://www.who.int/mediacentre/factsheets/fs348/en/>

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion.
* To reflect on the role of inclusion of marginalized communities and its possible impacts.
* To discuss the methods used to involve society in this kind of projects.

**Reflection questions**

* How do you think community engagement impacts a society?
* What are the possible social impacts of this project? And in the demography?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?

**SUSTAINABILITY**

**IMRR – “Integrated and sustainable water management of Red-Thai Binh Rivers System in changing climate”**

*RRI Key issues: sustainability and inclusive science*

The Red-Thai Binh Rivers basin is the largest in Vietnam, supplying for a total population of 26 million people[[22]](#footnote-22). This region is growing economically and in population numbers very fast. In this context, and with the aim to develop “strategies for the sustainable management of the Red-Thai Binh rivers system”, the IMRR project[[23]](#footnote-23),[[24]](#footnote-24) has been launched. This project intends to meet “Vietnamese society's long-term needs for water resources while maintaining essential ecological services and improving the economic benefits from hydropower production and agriculture”, so the initiative claims to “combine coordinated decision-making and stakeholder participation, supported by advanced modelling and optimization tools, and capacity building in local institutions”85.

Previously, according to the project’s information, there had been water shortages (and many problems derived from it) due to the “lack of coordination and inefficient operation of the reservoirs” 85. That is why the IMRR states that it wants to promote a participatory approach to include relevant stakeholders from different fields and ensure that Vietnamese institutions are given the tools and capacities to manage the Red River basin.

The IMRR project is funded by the Italian Ministry of Foreign Affairs (cooperation program).

**Learning objectives**

* To identify the stakeholders involved in the project
* To discuss the outcomes and possible use of the project for stakeholders
* To analyse the methodology used to obtain the results
* To understand the importance of public engagement in science and innovation practices
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Do you think that the data presented by the IMRR project could be biased?
* What is the role and possible importance of public engagement? How did public engagement contribute to this project? Can you think of negative environmental impacts of this project? And political impacts?
* Why do you think the Italian government funds such a project applied in Vietnam? Could this have negative impacts for the Vietnamese authority?

**The “KlimaAlltag” project**

*RRI Key issues: sustainability and inclusive science*

According to the “KlimaAlltag” project[[25]](#footnote-25), organised by the Institute for Social-Ecological Research (ISOE) in Frankfurt am Main, CO2 emissions come substantially from daily requirements of private households, these being the third source of CO2 (15%) only after the energy industry (25%) and transports (23%), and followed closely by the food industry (14%)[[26]](#footnote-26).

On this line, researchers from the “KlimaAlltag” project studied from 2010 to 2013 how daily behaviours varied in different social strata and tried to promote lifestyles and choices more environmentally sensitive. “KlimaAlltag” main focuses were on “mobility, nutrition, home living and household energy consumption”[[27]](#footnote-27).

The “KlimaAlltag” research did field tests and empirical surveys to households’ members, who also received climate-consultant advice for the following half year. According to the project leader, Immanuel Stieß, “more than half of those surveyed were basically ready to make changes in their behaviour”, and he adds that actions like “choosing green energy, buying seasonal and regional food, and using buses and trains more often” could decrease CO2 emissions by 10-15%.

“KlimaAlltag” explains in its leaflet[[28]](#footnote-28) that “the course and results of the field study were carried out and evaluated under scientific supervision”, and that they checked whether municipal climate protection measure would be possible and effective through a survey of 1000 people.

**Learning objectives**

* To identify the stakeholders involved in the project at all levels
* To understand the importance of public engagement in science and innovation practices
* To discuss the reason and methods used to involve society in this kind of projects
* To discuss the initial objectives and effectiveness of this program
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Do you think that the data presented by the “KlimaAlltag” organisers could be biased?
* Is the data presented applicable only in Europe or is a trend around the world?
* What is the role and possible importance of public engagement? How did public engagement contribute to this project?
* What stakeholders were involved in the research? Why have they been selected?
* Can you think of possible negative environmental impacts of this project? Have they been taken into consideration?
* How could the inclusion of more perspectives improve the overall project?

**The PIER project: “Public Involvement with Exhibition on Responsible Research and Innovation”**

*RRI Key issues: sustainability and inclusive science*

The PIER project[[29]](#footnote-29) was a European project of the 7th Framework Programme, which, according to the CORDIS website[[30]](#footnote-30), aimed to engage the public in Responsible Research and Innovation in society. As it is said in their report, the project developed an exhibition on the topic of Marine Research in the Mediterranean Sea. The exhibition was designed through several participatory activities to involve stakeholders, researchers, politicians, and the wider public. The PIER project wanted to enhance the importance of responsibility in research and to highlight the implications research can have on local development and on the quality of life of the citizens.91

As is described in their report, the involvement of the public and the experts started in the early stages of the project, with the realisation of workshops and focus groups. Citizen participation helped researchers decide the main topics of the exhibition, which were: fishery and aquaculture, biodiversity, energy from the sea, preventing disasters, new materials from the sea and safe maritime transportations.

The report mentions that the public was involved in questions related to responsible aspects of the Marine research: “how much personal behaviours can affect marine ecosystems, in terms of food selection, of waste disposal, on tourism activities, but also what people can do to improve the health of the Ocean, how people can have their say on research and policies related to the seas, how personal engagement can be strengthened, and how to get access to reliable scientific information and facts.”92

The project developed an exhibition with a participatory programme to engage the larger public in their achievements, for which it included different communication and participation channels like hands-on exhibits, prototypes, videos and multimedia products.

**Learning objectives**

* To understand the role of public engagement in science and innovation practices.
* To reflect on the role of science education in society and its possible impacts.
* To discuss the methods used to involve society in this kind of projects.
* To assess the possible environmental impacts of the project.

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* What is the role and possible importance of science education in this project?
* How can you promote reflection on R&I and its impacts in science education projects?
* Can you think of arguments against public engagement in science? What about science education?
* How can you promote reflection on R&I in the exhibition?
* What are the possible environmental impacts of this project?

**“MOSQUITO ALERT”**

*RRI Key issues: sustainability and inclusive science*

According to the European Centre for Disease Prevention and Control[[31]](#footnote-31), the tiger mosquito (Aedes albopictus) is an **invasive species and a** vector of diseases originating in Southeast Asia. Its habitat is mainly in urban areas where it breeds in small vessels or containers of stagnant water. According to the Mosquito Alert website[[32]](#footnote-32), this mosquito was detected in Spain for the first time in 2004, near Barcelona, and now it is present all around the Mediterranean coast.

The **Yellow fever mosquito** (Aedes aegypti) is a species of African origin found in Africa and tropical and subtropical countries, and it is also a vector of diseases. This mosquito has also adapted to urban areas, but currently there are no populations of Aedes aegyptiin Spain. However, as it is stated in the Mosquito Alert website, the increase of the global mean temperature could favour the eventual appearance of this mosquito in Spain.

The diseases transmitted by these mosquitoes are caused by viruses (like the Dengue virus, the Chikungunya virus or the Zika virus) and can result in fever and joint and muscle pain, among other symptoms, and can lead to hospitalization[[33]](#footnote-33).

The Mosquito Alert project wants to fight the invasive species of the tiger mosquito and the yellow fever mosquito. The project claims that: “To prevent transmission of these diseases it is crucial to control the presence of these species, minimize them in areas where they reside and control its expansion. To do this, the cooperation of citizens, along with the work of scientists, governments and managers of vectors and vector-borne diseases is essential.”93

Mosquito Alert describes itself as a **citizen science platform** that aims to unite citizens, **scientists**and**managers** in the fight against mosquito-borne diseases. “With the Mosquito Alert app anyone can report a possible finding of a tiger mosquito and its breeding sites by sending a photo. A team of experts is in charge of reviewing and classifying the photos before making them public on a map. With this information, scientists are studying the distribution of these mosquitoes.”

**Learning objectives**

* The students should be able to:
* Understand the role of public engagement in science and innovation practices
* Analyse the methodology used to involve society and obtain the results
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts, social and environmental, of the project

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* What is the role and possible importance of citizen science?
* Can you think of arguments against public engagement in science? Could there be problems related to the development of the project and results?
* Is there a wide range of stakeholders involved? How does this affect the project?
* What are the possible social and environmental impacts of the Mosquito Alert project?
* Do you think it’s positive to involve citizens in mosquito detection? What are the possible outcomes of these involvement?

**“The MARLISCO project”**

*RRI Key issues: sustainability and inclusive science*

**The MARLISCO project (from “MARine LItter in European Seas: Social AwarenesS and CO-Responsibility”)[[34]](#footnote-34), is a European initiative of the Seventh Framework Programme that went from June 2012 to the end of May 2015. In its website[[35]](#footnote-35) it is said that the project’s objective was to “raise public awareness, facilitate dialogue and promote co-responsibility among the different actors towards a joint vision for the sustainable management of marine litter across all European seas”.**

**The project’s context was, according to their website, that marine litter was an emerging thread to the environment and human health, a problem that has arisen from our** production systems, consumption patterns, and waste management.

MARLISCO’s website97,[[36]](#footnote-36) states that it wanted to raise awareness about social behaviours and their consequences, to promote co-responsibility among relevant stakeholders, and to achieve collective solutions for the litter impact, among other goals. MARLISCO’s activities took place in the four European seas (North-East Atlantic, Baltic, Mediterranean and Black Sea), and included **a “study**of the sources and trends regarding marine litter in each regional sea”, a best-practices collection from consortium countries, an attitude survey of different actors about marine litter, a European video contest, national debates and tailor-made activities in each partner country.

**Learning objectives**

* To identify the stakeholders involved in the project at all levels
* To understand the importance of public engagement in science and innovation practices
* To discuss the methods used to involve society in this kind of projects
* To analyse the initial objectives and effectiveness of this program
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Do you think that the data presented at the MARLISCO website could be biased?
* Do you think this project could be applied to the rest of the world, or is it only relatable to the production, consumption and waste-management patterns of Europe?
* What is the role and possible importance of public engagement? How did public engagement contribute to this project?
* What is the role and possible importance of science education? Is this project a good example?
* What are the stakeholders involved in MARLISCO? Why have they been selected?
* What are the possible environmental impacts? Can you think of possible negative impacts?
* Can you think of ways of improving the project by including more perspectives? Which ones?
* Can you think of ways the MARLISCO project promotes reflection on the impacts (ethical, legal, environmental, social) of marine litter?

**ETHICS**

**“Adolescents in HIV research”**

*RRI Key issues: ethics*

According to the TRREE project[[37]](#footnote-37), HIV is still a huge burden of disease in many settings. Optimal HIV prevention will possibly require a combination of interventions which should be tailored to specific sub-groups.[[38]](#footnote-38) At the moment, there is considerable prevention research agenda and HIV prevention trials are being conducted worldwide.[[39]](#footnote-39)

Up until now, the majority of HIV prevention trials have involved adult participants. Adolescents around the world are considered to be the epicentre of the epidemic, or close to.101 They demonstrate a range of behaviours that increase their risk of acquiring an HIV infection, for example an early sexual debut, overlapping sexual partnerships and inconsistent condom use.4  Because of this high risk, adolescents are one the principal populations for intervening to reduce risk of HIV acquisition.[[40]](#footnote-40) This means that they are important targets for up and coming biomedical approaches for HIV prevention.103 The TRREE project states that “It is imperative that adolescents are able to access safe and effective interventions to address their pressing health problems, including risk of HIV acquisition.”

According to Rudy et al100, changes that occur during adolescence can make it difficult to extrapolate data obtained in adult trials. In this manner, adolescents should be involved in trials to collect specific data about this group and to improve understanding of adolescent responses to biomedical prevention technologies. Some characteristics of adolescence, such as poorer impulse control, can make their participation in trials complicated, especially when it comes to issues such as retention and reporting all of which can impact on the scientific validity of trial results. 100,[[41]](#footnote-41)

The challenge of adolescent populations is to ensure they are adequately represented and protected. Adolescent involvement in research trials for HIV prevention therefore requires attention to ethical challenges so adolescent trials meet high-level legal and ethical standards.

**Learning objectives**

* To discuss the ethical guidelines that should govern such trials
* To assess who should be involved in the design and outcomes of these trials
* To reflect on the ethics of involving adolescents in clinical trials and the possible risks involved, and how they should be prevented

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Which cultural and social issues are involved in the execution of this project involving adolescents in HIV research?
* What ethical impacts should be anticipated in involving adolescents in clinical trials?
* What is the role of ethics in this project?
* Are there potentially harmful impacts of the project? How can they be prevented?

**“PPI PARKINSON’S”**

*RRI Key issues: ethics and inclusive science*

Parkinson's disease (PD) is a chronic and progressive movement disorder, meaning that symptoms continue and worsen over time. The cause is unknown, and although there is presently no cure, there are treatment options such as medication and surgery to manage its symptoms. As the World Health Organisation (WHO) states, about 1 in 500 people suffer from Parkinson's disease[[42]](#footnote-42), which means there are an estimated 127,000 people in the UK with the condition. Most people with Parkinson's start to develop symptoms when they're over 50, although around 1 in 20 people with the condition first experience symptoms when they're under 40.104

Parkinson’s UK is a charity that aims to contribute to better care, treatments and quality of life for people with Parkinson’s disease. They want to fund research that is relevant and beneficial to people affected by the condition. Therefore, they encourage researchers to work with patients and carers in designing, delivering and sharing their research. In this exercise, we will discuss some of the activity of this charity as a possible example of a good RRI practice. Specifically, we are interested in a pilot project run by Parkinson’s UK to facilitate involvement.[[43]](#footnote-43)

The main idea of the pilot project was the following: They sent an email to current grant-holders and co-applicants with an invitation to take part in the pilot, as well as advertising it in the Parkinson’s UK researcher e-newsletter. Eight research teams came forward, including a wide range of research projects and researchers. Fifty-two people affected by Parkinson’s were involved at five locations across the UK. These volunteers met with one or two researchers from one of the pilot projects. This allowed the researchers and volunteers to ask each other questions. The researchers were then encouraged to follow-up with the volunteers to seek further input.

According to Parkinson’s UK, there were three main ways in which the volunteers’ contributions made a difference to the research:

* Improving the written information about the research project.
* Improving the practical arrangements to make the research more feasible and acceptable for participants.
* Commenting on the ethical issues raised by the research.[[44]](#footnote-44)

**Learning objectives**

* To analyse the methodology used to obtain the results and involve society in the project
* To discuss the outcomes and possible use for stakeholders
* To identify the potential future impacts of the project
* To understand the role of public engagement in science and innovation practices
* To assess the ethical principles involved in this pilot project

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* (Which stakeholders are taking part in the public engagement activities and why have they been selected?)
* Can you think of arguments against public engagement in science? Could there be problems related to the involvement of patients in the setting of research agendas?
* Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?
* Are sufficient perspectives and participants included? How could one enrich the perspectives?
* What ethical impacts should be anticipated in this project?
* What is the role of ethics in this project?

**Responsible, Inclusive Innovation: a documentary on the Buchu Plant**

*RRI Key issues: sustainability, inclusive science and ethics*

The [ProGReSS project](http://www.progressproject.eu/) (PROmoting Global REsponsible research and Social and Scientific innovation) wanted to establish a global network on RRI “involving academia, SMEs, international organisations, policy advisors, research funders, NGOs and industry”. The project sought to connect “existing international networks of RRI with relevant societal actors”, to “compare science funding strategies and innovation policies in Europe, the US, China, Japan, India, Australia and South Africa”, to “advocate a European normative model for RRI globally”, and to foster “the convergence of regional innovation systems at the global level”.

The project developed the [documentary “Responsible, Inclusive Innovation - The Buchu Plant](https://www.youtube.com/watch?v=Nk_Tl7dK5O0)”. The film talks about the San people of Southern Africa, a marginalised community with deep knowledge on medicinal plants. The narrative focuses on the Buchu plant and its many uses. The film includes interviews with San people talking about the plant, its history, spirituality, and role in the San community. Other interviews include a pharmaceutical representative, a researcher, a professor from Cape Town University, and a San Legal representative. According to ProGReSS, the film was made to “show how traditional knowledge holders can collaborate with responsible entrepreneurs and scientists to drive inclusive innovation”.

The United Nation’s General Assembly “Report of the Special Rapporteur on the situation of human rights and fundamental freedoms of indigenous people[[45]](#footnote-45)”, focused on the indigenous peoples in Botswana (including the San), states that initiatives to address “marginalisation in political spheres and a history of underdevelopment” are important but “still suffer from a variety of shortcomings and need to be designed and implemented in a manner that recognizes and respects cultural diversity and (…) identities”.

**Bibliography:**

* <http://www.progressproject.eu/news/2044-responsible-inclusive-innovation-a-documentary-on-the-buchu-plant/>
* <http://www.progressproject.eu/>
* <http://unsr.jamesanaya.org/docs/countries/2010_report_botswana_en.pdf>

**Learning objectives**

* To reflect on the role of inclusion of marginalized communities and its possible impacts.
* To discuss the methods used to involve society in this kind of projects.
* To identify the stakeholders involved and assess the benefits of their inclusion.

**Reflection questions**

* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?
* Do you think this film is a good vehicle to promote reflection on R&I?
* Do you think this film helps the marginalised community? In what way?
* What are the possible environmental impacts of this project? And social impacts?

**UCL CHANGEMAKERS: Fostering Multiple Abilities through Sensory Object Engagements**

*RRI Key issues: inclusive science*

[UCL ChangeMakers](http://www.ucl.ac.uk/changemakers) promotes collaboration and innovation to improve the learning experience at UCL (University College London). This programme encourages students to work together with university staff, undertaking projects to benefit the UCL community, by providing funding and support. This method benefits both the students, by allowing them to become more engaged, responsible and pro-active; and the university, which gains the expertise and enthusiasm of the students to contribute to making UCL better.

**Fostering Multiple Abilities through Sensory Object Engagements** was a student-initiated project that took place during 2015-2016. The project parted from the question “What are the potential learning benefits of museum objects for students with specific learning disabilities?” with the aim of improving teaching techniques, especially those oriented towards students with learning disabilities. The idea was that education is very often text heavy, and this can sometimes be an obstacle for those who are visual learners or have more specific learning needs.

The hypothesis was discussed in various group sessions, and the students then held an open workshop, held at an Art Museum at UCL. The workshop was called “making teaching more accessible and learning more engaging”. According to the report, the workshop showed that “Using objects encourages students to think more laterally and actually apply the knowledge they have, forming stronger memories of the material. Using museum objects in seminars also engages student’s natural curiosity – encouraging students to speak up in class and share their ideas.” The participants were asked to offer feedback on the objects provided so the students could “proceed further with integrating tactile and kinaesthetic learning and if, where and how it would be viable to adopt this as a regular practice in teaching.”

The project showed that using museum objects in teaching could significantly improve learning experiences, making them much more enjoyable and accessible to all students, not just those with learning disabilities. The participants expressed that the objects might be especially useful in science and history classes, for example to show how science and technology have evolved over time. The props were seen to help conversation flow and intellectual discussion.

**Bibliography**

* 2015/16 UCL ChangeMakers Report: <https://www.ucl.ac.uk/changemakers/docs/UCL_ChangeMakers_Report_2015-16.pdf>
* <http://www.ucl.ac.uk/changemakers>

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion.
* To discuss the outcomes and possible use of the project for stakeholders.
* To assess the possible social and educational impacts.
* To discuss the methods used to involve society in this kind of projects.

**Reflection questions**

* What are the possible social impacts of this project?
* Do you think this project helps the student community? In what way?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?

**INCLUSIVE SCIENCE**

**“AMBIACT”**

*RRI Key issues: inclusive science*

According to the case study on Responsible Research and Innovation about Information and Communications Technology for Ageing People, the Ambiact is a smart meter designed to be placed in any power outlet, with an appliance to be plugged in to the Ambiact itself[[46]](#footnote-46). If the appliance is not used for a certain amount of time (generally, for more than 24 hours), the Ambiact will automatically generate an emergency call. This devise would provide elderly people who live alone with improved home safety and quality of life.[[47]](#footnote-47)

The Ambiact project claims that interviews were conducted during the whole product development in order to design the device according the people’s needs. The interviewees included social alarm customers and alarm operators. At the same time, the project also conducted two 13-months field trials involving approximately 100 people, where men and women were equally represented and where people with disabilities were also included. Results from these interactions were made publicly available and were used by the project in lectures, scientific talks and public presentations.[[48]](#footnote-48),[[49]](#footnote-49)

With its results, Ambiact concluded in its report that “the impact achieved by the project was the development of an innovative and patented product which is accepted by both the customer (e.g. care providers) and the end-user. It is currently sold by a start-up company, the Oldntec GmbH, to social alarm operators in Germany”.

**Learning objectives**

* Analyse the methodology used to obtain the results and to involve society in the project
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts of the product development
* Understand the importance of public engagement in science and innovation practices

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Can you think of possible negative impacts of this product? If so, which ones?
* Do you think people could feel that Ambiact violates their privacy?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* Which stakeholders are taking part in the public engagement activities and why have they been selected?
* Can you think of arguments against public engagement in science?
* Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?
* Are sufficient perspectives and participants included? How could one enrich the perspectives?

**“Mobile Education DNA Labs”**

*RRI Key issues: inclusive science*

The Article titled “Genomics Education in Practice: Evaluation of a Mobile Lab Design The DNA-Labs” explains that the gap between scientific research and school science is ever wider, and due to the rapid progresses in many fields, school education finds it difficult to keep up with all the new advances.[[50]](#footnote-50)

The initiative “DNA labs on the road” started in 2006 in the Netherlands as an extracurricular development activity to fill this gap between school science and scientific research, and to empower the students, the future citizens, to deal with these personal and societal science decisions. According to the DNA labs project[[51]](#footnote-51), the workshops organised offer students the opportunity to experience scientific research through experiments with equipment that usually is not available in schools, while at the same time, they place scientific research in a relevant societal context.111

In these DNA labs, teacher and student manuals were developed for each activity and given in advance of the introductory lessons, which were taught by teachers at the schools before the “lab” itself. The practical part of the lab was taught by visiting university students, who were previously trained by the institutions involved. The labs were offered free of charge to all secondary schools in the Netherlands. From the start of the project, the article reveals, the five mobile labs reached 54.000 students in 342 different schools.111

The DNA Labs were evaluated on their quality, learning outcomes and effect on the attitude of the students towards genomics applications through questionnaires and some personal interviews (also with teachers).111

**Learning objectives**

* The students should be able to:
* Understand the role of public engagement in science and innovation practices
* Evaluate the role of science education in schools, in science and innovation practices
* Identify the future impacts of this project
* Discuss the methods used to involve society in this project.

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* Do you think this project could be applicable around Europe? And around the world? If so, how?
* Do you think this project is a good tool to promote scientific careers among youngsters? Why?
* What is the role and possible importance of science education in this project?
* Which stakeholders are taking part in the education activities and why have they been selected?
* How can you promote reflection on R&I and its impacts in science education projects?
* Can you think of arguments against public engagement in science? What about science education?

**Sustainability in Prisons Project (SPP)**

*RRI Key issues: sustainability and inclusive science*

The [Sustainability in Prison Project](http://sustainabilityinprisons.org/) (SPP) is an initiative from the Evergreen State College (Washington) and Washington State Department of Corrections. Their mission is, according to their website, “to bring science, environmental education, and nature into prisons”. They “conduct ecological research and conserve biodiversity by forging collaborations with scientists, inmates, prison staff, students, and community partners”, while at the same time, “help reduce the environmental, economic, and human costs of prisons by inspiring and informing sustainable practices”. Ultimately, the SPP wants to help incarcerated people rebuild their lives.

Currently, the SPP has several programmes involving different actors, such as the “Beekeeping & Pollinator Landscapes” programme, the “Environmental Engagement Workshop Series”, the “Taylor’s Checkerspot Butterfly Rearing” and the “Western Pond Turtle Rehabilitation” programmes. They claim that all their programmes have five components: 1) Partnerships and collaborations with multiple benefits, 2) Bringing nature “inside”, 3) Engagement and education, 4) Safe and sustainable operations, and 5) Evaluation, dissemination and tracking.

As stated in their website, the SPP is funded by different conservation organizations and state and federal agencies, such as the Washington State Department of Corrections, the Centre for Natural Lands Management, or the Institute for Applied Ecology. The SPP publishes a biannual newsletter and has a Facebook page.

**Bibliography:**

* <http://sustainabilityinprisons.org/>
* <http://www.evergreen.edu/>
* <http://www.doc.wa.gov/>
* <https://www.facebook.com/sustainabilityinprisons/>

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion
* To discuss the outcomes and possible use of the project for stakeholders
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* In what ways do you think the SPP is “Responsible”? Do you think it is also “Irresponsible” in other ways?
* Do you think the SPP is a good example of research done responsibly? Why?
* What is the role of public engagement in this project? Who is it involving and why?
* Can you think of negative environmental impacts of this project? And political impacts?
* Who is this initiative addressed to?

**CROSSCULT: Where History meets IT**

*RRI Key issues: inclusive science*

**“Nothing in History occurs just because one person causes one event. Everything has to be understood in a wider context. “**

[CrossCult](http://www.crosscult.eu/) is a project that has received funding from the European Union's [Horizon 2020](https://ec.europa.eu/programmes/horizon2020/) research and innovation programme. The aim of CrossCult is to “better understand and reinterpret history and culture”, as they describe in their website. The project describes itself as “empowering reuse of digital cultural heritage in context-aware crosscuts of European history”, to provoke a change in the way citizens of Europe view history.

The idea is that history is a complex web of interrelated events and facts, not a collection of unconnected happenings, which is how it is often taught. The project plans to change people’s views on what they have learnt by providing them with “pieces of cultural heritage, other citizens' viewpoints and physical venues”. In this manner, CrossCult aims to promote reflection amongst citizens, helping them to reinterpret history in a wider and more global way.

CrossCult considers that the way history is taught in school and universities is lacking in certain aspects such as “cross-border cultural aspects and global views”. According to their website, the experiences they have designed aim to: raise consciousness, give an overview of historical events from multiple perspectives, approach history via alternative sources (archaeological remains, iconography, epigraphy, numismatics, architecture, art, etc.) and transmit the fact that there can be many contrasting viewpoints in history.

The project uses technology and mobile apps as a tool to reach citizens across Europe. The project states in their website that the idea is to “connect people to digital and physical historical artefacts and in different places across Europe”. The end products will be a semantic knowledge base that “interrelates an unrestricted set of (existing and future) digital cultural heritage resources and venues across different repositories, on the grounds of common properties or crosscutting, transversal concepts”, and also to “design business models and plans for the exploitation of the project results in collaboration with a new network of researchers, scholars, ICT professionals and specialists of digital heritage.”

**Bibliography:**

* [**http://www.crosscult.eu**](http://www.crosscult.eu)

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion
* To assess the possible social and political impacts
* To analyse the methods used to involve society in this kind of projects
* To discuss the outcomes and possible use of the project for stakeholders

**Reflection questions**

* What are the possible social impacts of this project?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?

**ANNEX 2. HEIRRI CASES WITH ANSWERS**

**CASE EXAMPLE 1: MOSQUITO ALERT**

*RRI Key issues: sustainability and inclusive science*

According to the European Centre for Disease Prevention and Control[[52]](#footnote-52), the tiger mosquito (Aedes albopictus) is an **invasive species and a** vector of diseases originating in Southeast Asia. Its habitat is mainly in urban areas where it breeds in small vessels or containers of stagnant water. According to the Mosquito Alert website[[53]](#footnote-53), this mosquito was detected in Spain for the first time in 2004, near Barcelona, and now it is present all around the Mediterranean coast.

The **Yellow fever mosquito** (Aedes aegypti) is a species of African origin found in Africa and tropical and subtropical countries, and it is also a vector of diseases. This mosquito has also adapted to urban areas, but currently there are no populations of Aedes aegyptiin Spain. However, as it is stated in the Mosquito Alert website, the increase of the global mean temperature could favour the eventual appearance of this mosquito in Spain.

The diseases transmitted by these mosquitoes are caused by viruses (like the Dengue virus, the Chikungunya virus or the Zika virus) and can result in fever and joint and muscle pain, among other symptoms, and can lead to hospitalization[[54]](#footnote-54).

The Mosquito Alert project wants to fight the invasive species of the tiger mosquito and the yellow fever mosquito. The project claims that: “To prevent transmission of these diseases it is crucial to control the presence of these species, minimize them in areas where they reside and control its expansion. To do this, the cooperation of citizens, along with the work of scientists, governments and managers of vectors and vector-borne diseases is essential.”93

Mosquito Alert describes itself as a **citizen science platform** that aims to unite citizens, **scientists**and**managers** in the fight against mosquito-borne diseases. “With the Mosquito Alert app anyone can report a possible finding of a tiger mosquito and its breeding sites by sending a photo. A team of experts is in charge of reviewing and classifying the photos before making them public on a map. With this information, scientists are studying the distribution of these mosquitoes.”

**Learning objectives**

* The students should be able to:
* Understand the role of public engagement in science and innovation practices
* Analyse the methodology used to involve society and obtain the results
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts, social and environmental, of the project

**Reflection questions**

Do you think the case presented is a good example of research done responsibly? Why?

Yes, because it explains how science can incorporate society in its projects in an inclusive way for the benefit of all.

What aspects of RRI can you see in this case? How are these aspects achieved and worked on?

Dimensions: Inclusive, Openness, Adaptability

This case clearly involves society in a very wide way (Inclusive), the only requisite is to have a smartphone. It is also a very open access since results are published online (Openness) and the research is an ongoing process, advancing according to the inputs received from the territory (Adaptability).

Key issues: Public engagement, Science education, Open access

The citizen science approach is a clear example of Public engagement. It has a clear component of Science education, as explained in the text, because those who get involved also get informed and usually become advocates for the cause. It is also in favour of open access for the nature of the data received.

What is the role and possible importance of public engagement? How does public engagement contribute to this project?

Public Engagement can be understood in one of the following ways:

* **Engagement to increase the interest, understanding and science literacy of a society**. Dissemination of results, outreach activities, expositions and media communication (including social media), are activities under this kind of PE. This perspective is one-directional, by which the scientific community shares its knowledge with society to help everyone be better informed and familiarised with the R+D+I system, and more engaged with science and its applications.
* **Engagement to favour active participation and responsibility redistribution.** Activities under this kind of PE would include the Mobilisation and Mutual Learning (MML) exercises, dialogue activities such as science cafés, formal participation formats like consensus conferences and referendums, Community-based research, Living Labs, Citizen science activities, etc. In all these activities, communication is bi-directional or multidimensional, a dialogue is established and, in some cases, responsibility is redistributed. Their aim is to actively involve society or specific stakeholders in the some or all phases of the R+D+I process.

In the case of the Mosquito Alert project, the engagement achieved works in both ways because society gets informed and more interested in a particular science topic, but society also contributes actively to the data gathering of the research.

Can you think of arguments against public engagement in science? Could there be problems related to the development of the project and results?

There could be problems related to this particular case, for example, if people did not collect the data correctly and it caused contradictions or fake results (for instance, if the pictures were not properly geolocated).

Is there a wide range of stakeholders involved? How does this affect the project?

The main stakeholder involved is the society as a whole. This affects the project in the sense that it can rely on individuals for collecting data on the location of mosquitos. The project could also involve hospitals, research centres, botanist…

What are the possible impacts of the Mosquito Alert project?

A possible impact is that society becomes more aware of the presence of mosquitos and develops an environmentally conscious approach to their surroundings. If people are more conscious about the nesting mechanisms of mosquitos, maybe they can prevent the creation of new water puddles or ponds.

**CASE EXAMPLE 2: AMBIACT**

**“AMBIACT”**

*RRI Key issues: inclusive science*

According to the case study on Responsible Research and Innovation about Information and Communications Technology for Ageing People, the Ambiact is a smart meter designed to be placed in any power outlet, with an appliance to be plugged in to the Ambiact itself[[55]](#footnote-55). If the appliance is not used for a certain amount of time (generally, for more than 24 hours), the Ambiact will automatically generate an emergency call. This devise would provide elderly people who live alone with improved home safety and quality of life.[[56]](#footnote-56)

The Ambiact project claims that interviews were conducted during the whole product development in order to design the device according the people’s needs. The interviewees included social alarm customers and alarm operators. At the same time, the project also conducted two 13-months field trials involving approximately 100 people, where men and women were equally represented and where people with disabilities were also included. Results from these interactions were made publicly available and were used by the project in lectures, scientific talks and public presentations.[[57]](#footnote-57),[[58]](#footnote-58)

With its results, Ambiact concluded in its report that “the impact achieved by the project was the development of an innovative and patented product which is accepted by both the customer (e.g. care providers) and the end-user. It is currently sold by a start-up company, the Oldntec GmbH, to social alarm operators in Germany”.

**Learning objectives**

* Analyse the methodology used to obtain the results and to involve society in the project
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts of the product development
* Understand the importance of public engagement in science and innovation practices

**Reflection questions**

Do you think the case presented is a good example of research done responsibly? Why?

Yes, because it shows how an innovation considers end-users and involved stakeholders from the very start of the development process. Those behind Ambiact seem to understand that including relevant actors in an innovation process is beneficial, not only economically, but also for those addressed by the technology itself. Ambiact is a good example of research done responsibly.

What aspects of RRI can you see in this case? How are these aspects achieved and worked on?

Dimensions: Inclusivity, Reflection, Adaptability

These dimensions are achieved by, first, reflecting on how to make a good new piece of technology in a responsible way (Reflection). Then also by including different stakeholders (inclusivity) and taking into account and integrating into the technology what these actors give back (Adaptability).

Key issues: Ethics, Gender, Public engagement

Ambiact is managed considering the several stakeholders affected by the technology and making them participate in the process (Public engagement), also considering their gender diversity (Gender). In the process of testing the technology, it is most likely that guidelines for an ethical approach where followed.

Can you think of possible negative impacts of this product? If so, which ones?

Yes. Maybe some people would feel their privacy under threat. Or an error in the monitoring that would result in the alarm being sent off, which would cause distress to all actors involved.

What is the role and possible importance of public engagement? How does public engagement contribute to this project?

Public Engagement can be understood in one of the following ways:

* **Engagement to increase the interest, understanding and science literacy of a society**. Dissemination of results, outreach activities, expositions and media communication (including social media), are activities under this kind of PE. This perspective is one-directional, by which the scientific community shares its knowledge with society to help everyone be better informed and familiarised with the R+D+I system, and more engaged with science and its applications.
* **Engagement to favour active participation and responsibility redistribution.** Activities under this kind of PE would be the Mobilisation and Mutual Learning (MML) exercises, dialogue activities such as science cafés, formal participation formats like consensus conferences and referendums, Community-based research, Living Labs, Citizen science activities, etc. In all these activities, communication is bi-directional or multidimensional, a dialogue is established and, in some cases, responsibility is redistributed. Their aim is to actively involve society or specific stakeholders in the some or all phases of the R+D+I process.

In the case of Ambiact, we would be talking of the second kind of engagement. The public contributes to the development of the technology in an active and thoughtful way, consciously providing with feedback. The final product of Ambiact is, therefore, more robust and socially accepted because potential stakeholders have been included in its development.

Which stakeholders are taking part in the public engagement activities and why have they been selected?

Stakeholders involved: social alarm customers, alarm operators, potential users (men and women), people with disabilities.

They have been selected because they will be directly affected by the implementation of this technology (potential users, social alarm customers) or because their expertise can be a good asset for the technological development of the product (alarm operators).

Can you think of arguments against public engagement in science?

Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?

Yes. They conducted interviews and trials, but other good methods would be focus groups, science cafés for local communities, and general community-based research. Different types of public engagement work best for different things, so using other methodologies would be beneficial to discover other perspectives.

Are sufficient perspectives and participants included? How could one enrich the perspectives?

Participants that are not mentioned in the description of Ambiact but that could be of great interest for the development of the product would be the family members or closest friends of the end-users. That is, those who would receive the emergency call if an accident happened.

**CASE EXAMPLE 3: PPI PARKINSON’S**

*RRI Key issues: ethics and inclusive science*

Parkinson's disease (PD) is a chronic and progressive movement disorder, meaning that symptoms continue and worsen over time. The cause is unknown, and although there is presently no cure, there are treatment options such as medication and surgery to manage its symptoms. As the World Health Organisation (WHO) states, about 1 in 500 people suffer from Parkinson's disease[[59]](#footnote-59), which means there are an estimated 127,000 people in the UK with the condition. Most people with Parkinson's start to develop symptoms when they're over 50, although around 1 in 20 people with the condition first experience symptoms when they're under 40.104

Parkinson’s UK is a charity that aims to contribute to better care, treatments and quality of life for people with Parkinson’s disease. They want to fund research that is relevant and beneficial to people affected by the condition. Therefore, they encourage researchers to work with patients and carers in designing, delivering and sharing their research. In this exercise, we will discuss some of the activity of this charity as a possible example of a good RRI practice. Specifically, we are interested in a pilot project run by Parkinson’s UK to facilitate involvement.[[60]](#footnote-60)

The main idea of the pilot project was the following: They sent an email to current grant-holders and co-applicants with an invitation to take part in the pilot, as well as advertising it in the Parkinson’s UK researcher e-newsletter. Eight research teams came forward, including a wide range of research projects and researchers. Fifty-two people affected by Parkinson’s were involved at five locations across the UK. These volunteers met with one or two researchers from one of the pilot projects. This allowed the researchers and volunteers to ask each other questions. The researchers were then encouraged to follow-up with the volunteers to seek further input.

According to Parkinson’s UK, there were three main ways in which the volunteers’ contributions made a difference to the research:

* Improving the written information about the research project.
* Improving the practical arrangements to make the research more feasible and acceptable for participants.
* Commenting on the ethical issues raised by the research.[[61]](#footnote-61)

**Learning objectives**

* To analyse the methodology used to obtain the results and involve society in the project
* To discuss the outcomes and possible use for stakeholders
* To identify the potential future impacts of the project
* To understand the role of public engagement in science and innovation practices
* To assess the ethical principles involved in this pilot project

**Reflection questions**

Do you think the case presented is a good example of research done responsibly? Why?

Yes, because it presents an active approach to a more direct participation of the main stakeholders of a specific field – that is, the people affected by the Parkinson’s disease in Parkinson’s disease research. It is responsible because it engages with the patients to understand better their needs and expectations and properly respond to these. Also, to share the current lines of research and see how they are accepted by the ultimate recipients.

What aspects of RRI can you see in this case? How are these aspects achieved and worked on?

Dimensions: Inclusion, Adaptiveness

The project clearly includes different stakeholders (Inclusion) and consults with them in order to better shape/reshape its research lines (Adaptiveness).

Key issues: Public engagement, Ethics, Science Education

The project counts with the benefits of Public engagement. It also contributes to Science education, since in the process of consulting and engaging, the participating subjects learn about the research field and particularities. Ethics is a clear aspect of this initiatives, since all research done with human individuals is subjected to a strong Ethic framework and standards.

Which stakeholders are taking part in the public engagement activities and why have they been selected?

According to the text provided, the initiative engaged current grant-holders and co-applicants, research teams, people affected by Parkinson’s and carers. They have been selected because they are key actors in the field of Parkinson’s disease, either because they are affected by it (patients), because they work with people affected by it (carers), or because they work on the research developments and possible cures (researchers).

Can you think of arguments against public engagement in science? Could there be problems related to the involvement of patients in the setting of research agendas?

If we agree that biomedical research should be ultimately addressed to patients, then we can say that engaging the public in the progress of research is only beneficial, since it allows researchers and funding agencies to better understand the needs and expectations of patients and tackle them accordingly.

Some might say that involving patients in the setting of research agendas might be negative because they not necessarily understand the nature of science projects and might ask for unrealistic goals. However, this can be compensated with science education and by only adapting the science research to patients’ requests from a realistic understanding of what is and what isn’t feasible -by taking into account what patients want and need, without being tied to it.

Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?

Yes. The project could have also included other Public engagement methods like focus groups, science cafés or public consultations. These methods are good for obtaining other perspectives and maybe including more people, and therefore would have contributed to gaining a broader and more complete picture of what the patients of Parkinson’s disease and their carers want and expect from research.

Are sufficient perspectives and participants included? How could one enrich the perspectives?

The people included are of course crucial, but the overall engagement would have been richer if other stakeholders had been included. For example, close relatives of patients, funding agencies, doctors, nurses and psychologist working with people affected by the Parkinson’s disease, or managers of nursing centres.

1. Pappas, C. (2015). 7 Tips On How To Use Forums In eLearning. Retrieved 1 August 2016, from https://elearningindustry.com/7-tips-use-forums-in-elearning [↑](#footnote-ref-1)
2. Salmon, G. (2004). *E-moderating: The Key to Teaching and Learning Online* (2nd ed.). London/New York, NY: Taylor & Francis [↑](#footnote-ref-2)
3. [http://genderedinnovations.stanford.edu/case-studies/urban.html#tabs-2](http://genderedinnovations.stanford.edu/case-studies/urban.html" \l "tabs-2) [↑](#footnote-ref-3)
4. Hayden, D. (2005). What Would A Non-Sexist City Be Like? Speculations on Housing, Urban Design, and Human Work. In Fainstein, S., & Servon, L. (Eds.), Gender and Planning: A Reader, pp. 47-64. New Brunswick: Rutgers University Press. [↑](#footnote-ref-4)
5. <http://www.unwomen.org/en> [↑](#footnote-ref-5)
6. <http://interactive.unwomen.org/multimedia/infographic/changingworldofwork/img/data/unpaidwork.png> [↑](#footnote-ref-6)
7. map: <https://goo.gl/maps/s95YuPMoLzN2> [↑](#footnote-ref-7)
8. [https://genderedinnovations.stanford.edu/case-studies/hiv.html#tabs-2](https://genderedinnovations.stanford.edu/case-studies/hiv.html" \l "tabs-2) [↑](#footnote-ref-8)
9. Marchetti, M. & Raudma, T. (Eds). (2010). Stocktaking: 10 Years of “Women in Science” Policy by the European Commission, 1999-2009. Luxembourg: Publications Office of the European Union. [↑](#footnote-ref-9)
10. Rosser, S. (2008) Building Two-Way Streets to Implement Policies that Work for Gender and Science. In Schiebinger, L. (Ed.), Gendered Innovations in Science and Engineering, pp. 182-197. Stanford: Stanford University Press. [↑](#footnote-ref-10)
11. Faulkner, W. (2000). The Power and the Pleasure? A Research Agenda for Making Gender Stick to Engineers. *Science, Technology, and Human Values*, *25 (1),* 87-119 [↑](#footnote-ref-11)
12. Faulkner, W. (2007). Nuts and Bolts and People: Gender-Troubled Engineering Identities. *Social Studies of Science*, *37 (3)*, 331-356. [↑](#footnote-ref-12)
13. Sagebiel, F., Dahmen, J., Davidsson, B., Godfroy-Jenin, A., Rommes, E., Thaler, A., & Urbancikova, N. (2008). *Motivations of Young People for Studying Science, Engineering, and Technology (SET): The Gender Perspective*. Wuppertal: University of Wuppertal Press. [↑](#footnote-ref-13)
14. <http://www.who.int/hiv/en/> [↑](#footnote-ref-14)
15. http://files.unaids.org/en/media/unaids/contentassets/documents/factsheet/2014/20140716\_FactSheet\_en.pdf [↑](#footnote-ref-15)
16. http://www.unaids.org/sites/default/files/media\_asset/global-AIDS-update-2016\_en.pdf [↑](#footnote-ref-16)
17. World Health Organisation (WHO), Malaria site (http://www.who.int/malaria/en/) [↑](#footnote-ref-17)
18. World Health Organisation (WHO), Malaria site: <http://www.who.int/malaria/en/> and <http://www.who.int/malaria/publications/world-malaria-report-2016/WMR-2016-key-points.pdf?ua=1> [↑](#footnote-ref-18)
19. Gender in EU funded research – Toolkit and Training – Module 2, Field 1: Gender and Health (https://yellowwindow.com/genderinresearch/downloads/YW2009\_GenderToolKit\_field1\_Health\_001.pdf) [↑](#footnote-ref-19)
20. Cordis – MALVEBLOK project: http://cordis.europa.eu/project/rcn/90124\_en.html [↑](#footnote-ref-20)
21. Gender in EU funded research – Toolkit and Training – Module 2, Field 1: Gender and Health: <https://yellowwindow.com/genderinresearch/downloads/YW2009_GenderToolKit_field1_Health_001.pdf> [↑](#footnote-ref-21)
22. http://baobab.elet.polimi.it/twoleweb/projects/imrr/ [↑](#footnote-ref-22)
23. http://xake.elet.polimi.it/imrr/ [↑](#footnote-ref-23)
24. European Foundations Award for Responsible Research & Innovation - Youtube video: <https://www.youtube.com/watch?time_continue=59&v=L1ibR7oylQU> [↑](#footnote-ref-24)
25. “KlimaAlltag” website: <http://www.klima-alltag.de/Forschungsansatz.3.0.html> [↑](#footnote-ref-25)
26. EuroStat: “Greenhouse gas emissions by economic activity and by pollutant, EU-28, 2014 (thousand tonnes of CO2 equivalents)”: <http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Greenhouse_gas_emissions_by_economic_activity_and_by_pollutant,_EU-28,_2014_(thousand_tonnes_of_CO2_equivalents)_YB17.png> [↑](#footnote-ref-26)
27. “KlimaAlltag section at the ”Institute for Social-Ecological Research“ (ISOE) website: <http://www.isoe.de/en/projects/completed-projects/energie-und-klimaschutz-im-alltag/klimaalltag/> [↑](#footnote-ref-27)
28. “KlimaAlltag” leaflet: <http://www.klima-alltag.de/uploads/media/Reducing-Carbon-Emissions_Schuldt-Baumgart_Stiess-2014.pdf> [↑](#footnote-ref-28)
29. <http://cordis.europa.eu/result/rcn/165387_en.pdf>

    <http://cordis.europa.eu/result/rcn/165387_en.html> [↑](#footnote-ref-29)
30. <http://cordis.europa.eu/project/rcn/111478_en.html> [↑](#footnote-ref-30)
31. European Centre for Disease Prevention and Control: <http://ecdc.europa.eu/en/healthtopics/vectors/surveillance-invasive-mosquitoes/pages/disease-risk.aspx> [↑](#footnote-ref-31)
32. Mosquito Alert website: <http://www.mosquitoalert.com/en/> [↑](#footnote-ref-32)
33. <http://www.mosquitoalert.com/en/about-mosquitos/biology/> [↑](#footnote-ref-33)
34. CORDIS page on MARLISCO: http://cordis.europa.eu/project/rcn/103611\_en.html [↑](#footnote-ref-34)
35. http://www.marlisco.eu/about-project.en.html [↑](#footnote-ref-35)
36. MARLISCO Twitter: <https://twitter.com/MarliscoProject> [↑](#footnote-ref-36)
37. <http://elearning.trree.org/> [↑](#footnote-ref-37)
38. Rudy, B.J. Kapogiannis, B.G., Lally, M.A., Gray, G.E., Bekker, L., Krogstad, P., & McGowan, I. (2010). Youth-specific considerations in the development of Pre-Exposure Prophylaxis, Microbicide, and Vaccine research trials. Journal of Acquired Immune Deficiency Syndromes, 54(1), S31–S42. [↑](#footnote-ref-38)
39. Nelson, R.M., Lewis, L.L., Struble, K., & Wood, S.F. (2010). Ethical and regulatory considerations for the inclusion of adolescents in HIV biomedical prevention research. Journal of Acquired Immune Deficiency Syndromes, 54(1), S18–S24. [↑](#footnote-ref-39)
40. Wilson, C.M., Wright, P.F., Safrit, J.T., & Rudy, B. (2010). Epidemiology of HIV infection and risk in adolescents and youth. Journal of Acquired Immune Deficiency Syndromes, 54(1), S5–S6. [↑](#footnote-ref-40)
41. Hosek, S.G., & Zimet, G.D. (2010). Behavioural considerations for engaging youth in HIV clinical research. Journal of Acquired Immune Deficiency Syndromes, 54(1), S25–S30. [↑](#footnote-ref-41)
42. World Health Organisation (WHO), Neurological Disorders: Public Health Challenges <http://www.who.int/mental_health/publications/neurological_disorders_ph_challenges/en/> [↑](#footnote-ref-42)
43. <https://www.parkinsons.org.uk/content/patient-and-public-involvement-ppi-your-study> [↑](#footnote-ref-43)
44. <https://www.parkinsons.org.uk/sites/default/files/cs2442_ppi_evaluation_pilot.pdf> [↑](#footnote-ref-44)
45. <http://unsr.jamesanaya.org/docs/countries/2010_report_botswana_en.pdf> [↑](#footnote-ref-45)
46. Ambiact – product description: <http://www.oldntec.eu/wp-content/downloads/ambiact_Hausnotruf.pdf> [↑](#footnote-ref-46)
47. Ambiact website: <http://www.oldntec.eu/en/> [↑](#footnote-ref-47)
48. <http://www.responsible-industry.eu/activities/bu-casestudies-results> [↑](#footnote-ref-48)
49. Project Report: <http://bit.ly/2qD5fb6> [↑](#footnote-ref-49)
50. Marc H.W. Van Mil, Dirk Jan Boerwinkel, Jacobine E. Buizer-Voskamp, Annelies Speksnijder,and Arend Jan Waarlo *Genomics Education in Practice: Evaluation of a Mobile Lab Design,* BIOCHEMISTRY AND MOLECULAR BIOLOGY EDUCATION, Vol. 38, No. 4, pp. 224–229, 2010  
    http://onlinelibrary.wiley.com/doi/10.1002/bmb.20397/epdf [↑](#footnote-ref-50)
51. <http://www.dnalabs.nl/english/> [↑](#footnote-ref-51)
52. European Centre for Disease Prevention and Control: <http://ecdc.europa.eu/en/healthtopics/vectors/surveillance-invasive-mosquitoes/pages/disease-risk.aspx> [↑](#footnote-ref-52)
53. Mosquito Alert website: <http://www.mosquitoalert.com/en/> [↑](#footnote-ref-53)
54. <http://www.mosquitoalert.com/en/about-mosquitos/biology/> [↑](#footnote-ref-54)
55. Ambiact – product description: <http://www.oldntec.eu/wp-content/downloads/ambiact_Hausnotruf.pdf> [↑](#footnote-ref-55)
56. Ambiact website: <http://www.oldntec.eu/en/> [↑](#footnote-ref-56)
57. <http://www.responsible-industry.eu/activities/bu-casestudies-results> [↑](#footnote-ref-57)
58. Project Report: <http://bit.ly/2qD5fb6> [↑](#footnote-ref-58)
59. World Health Organisation (WHO), Neurological Disorders: Public Health Challenges <http://www.who.int/mental_health/publications/neurological_disorders_ph_challenges/en/> [↑](#footnote-ref-59)
60. <https://www.parkinsons.org.uk/content/patient-and-public-involvement-ppi-your-study> [↑](#footnote-ref-60)
61. <https://www.parkinsons.org.uk/sites/default/files/cs2442_ppi_evaluation_pilot.pdf> [↑](#footnote-ref-61)